National Institute of Environmental Health Sciences

Climate impacts on environmental risks evaluated from space: A conceptual approach to the case of Rift Valley Fever in Senegal

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Abstract:

Background: Climate and environment vary across many spatio-temporal scales, including the concept of climate change, which impact on ecosystems, vector-borne diseases and public health worldwide. Objectives: To develop a conceptual approach by mapping climatic and environmental conditions from space and studying their linkages with Rift Valley Fever (RVF) epidemics in Senegal. Design: Ponds in which mosquitoes could thrive were identified from remote sensing using high-resolution SPOT-5 satellite images. Additional data on pond dynamics and rainfall events (obtained from the Tropical Rainfall Measuring Mission) were combined with hydrological in-situ data. Localisation of vulnerable hosts such as penned cattle (from QuickBird satellite) were also used. Results: Dynamic spatio-temporal distribution of Aedes vexans density (one of the main RVF vectors) is based on the total rainfall amount and ponds' dynamics. While Zones Potentially Occupied by Mosquitoes are mapped, detailed risk areas, i.e. zones where hazards and vulnerability occur, are expressed in percentages of areas where cattle are potentially exposed to mosquitoes' bites. Conclusions: This new conceptual approach, using precise remote-sensing techniques, simply relies upon rainfall distribution also evaluated from space. It is meant to contribute to the implementation of operational early warning systems for RVF based on both natural and anthropogenic climatic and environmental changes. In a climate change context, this approach could also be applied to other vector-borne diseases and places worldwide.

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Resource Description

Early Warning System: ☑

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure : ☑

weather or climate related pathway by which climate change affects health

Ecosystem Changes, El Nino Southern Oscillation

Geographic Feature: ☑

resource focuses on specific type of geography

Freshwater

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Africa

African Region/Country: African Country

Other African Country: Senegal

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: Rift Valley Fever

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction, Methodology

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Short-Term (

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content